Section 2: Inventory of Water Resources

> *Note: If the requested information is not available, describe how that information will be obtained for the next Plan revision or state that the information is historical and cannot be reconstructed.*

Information developed in this section will allow you to calculate a water inventory. A water inventory is a simplified water balance, quantifying how much water comes into the district, how that water is used within the district, and how much water leaves the district. Data entered should be for the year given at the beginning of this Plan (within the last 2 years).

A. Surface Water Supply

1. Acre-foot amounts of surface water delivered to the contractor by each of the contractor's sources.

In Table 1 of the Water Accounting Tables, quantify all contractor surface water supplies. Specify the amount and type of water (i.e., urban, agricultural, class II, spill, etc.) delivered to the district by month - enter the requested information in Table 1. If you do not receive State water, local surface water, or other surface water then those columns will be blank. Amount of water received under each right and/or contract for the last 10 years. In Table 8, quantify the amount of each type of surface water the contractor actually received in each of the last 10n years. If the contractor has sources of surface water that are not listed in the table, add the necessary columns.

B. Ground Water Supply

1. Acre-foot amounts of ground water pumped and delivered by the contractor.

Quantify contractor ground-water supplies in Table 2. Specify the monthly amount of ground-water pumped by the contractor. The "Pumped by Customers" column asks only for an estimate of private yearly ground-water pumping. If the contractor and/or private parties do not pump ground water, these columns will be blank.

2. Ground-water basin(s) that underlie the district.

Information necessary to describe ground-water basins can be found in California, DWR Bulletin 118-80, which identifies ground-water basins in California. Bulletin 118-80 describes the general boundaries of each basin and indicates if there is evidence of overdraft. You can use this Bulletin to identify the basin or basins that underlie your boundaries and their size, usable

capacity, and safe yield. Large ground-water basins underlie several districts. In a few cases, districts overlie more than one ground-water basin.

3. Contractor operated wells and managed ground-water recharge areas.

The Plan should provide a map of the district and the extent of the ground-water basin(s) within the district boundaries. Indicate on the map the location of district ground-water wells and any managed ground-water recharge areas.

4. If there is conjunctive use of surface and ground water, describe it.

Information necessary to adequately describe ground water conjunctive use programs includes:

a. Determination of the ground water quality (i.e., is the ground-water quality adequate for direct use or is blending possible?).

b. The amount of ground-water storage capacity currently available and how much additional storage could be available by extracting ground water for use.

c. The location of existing and potential recharge sites (spreading basins, instream, or injection wells) and identification of the soil types and recharge rates.

d. Determination of hydraulic continuity between the possible recharge and extraction areas.

e. Identification of possible sources of recharge water and the quantities, qualities, and time of availability from each source.

f. For districts without district-owned wells, describe how the district will receive compensation from the beneficiaries of the ground-water recharge.

5. For managed ground-water basins, attach a copy of the management plan.

If the contractor or its customers use ground water from a managed or adjudicated ground-water basin, attach a copy of the Plan.

6. For participation in ground-water banking, attach a description of the banking plan.

If the contractor participates in ground-water banking, insert here or indicate where attached, a description or table indicating how much and when water was banked, and how much and when it is available for retrieval.

C. Other Water Supplies

Acre-foot amounts of "Other" water used as part of the contractor's water supply.

All surface and ground-water supplies should be identified and quantified in Tables 1 and 2. For instance, a long-term water transfer agreement or water only available while a reservoir is spilling should be listed as part of the year's water supply. Quantify "Other" water supplies in Table 1.

D. Source Water Quality Monitoring Practices

1. Water quality problems.

Describe any surface water or ground-water quality problems and how the quality problems limit the use of the water or affect customer water-use decisions.

2. Urban contractors.

Attach the current year Customer Water Quality Report that is mailed to all customers. This report provides information on the quality of each of the contractor's water sources. If there are water quality concerns and/or problems, describe how they affect the contractor's water treatment process and its customers

3. Agricultural contractors.

If you have concerns with surface or ground-water quality, complete the following:

Concerns Yes _____ No _____

Indicate if the contractor has any surface or ground-water quality issues that affect customer-use decisions.

If there are water quality concerns and/or problems, describe the quality problems and how they affect the water's use.

4. Current year water quality monitoring programs for ground water.

If there are water quality concerns and/or problems, identify which agencies conduct the Water Quality Testing Program, and for each constituent, identify the:

a. Analyses performed.

b. Frequency range.
c. Concentration range and average.

5. *Agricultural contractors current year total dissolved solids (TDS) range for surface water and ground water.*

Surface water: _____ ppm Ground water: _____ ppm

If there are water quality issues, enter the TDS content by source. This is requested due to its impact on the leaching requirement. Describe how the contractor's customers are notified of changes in the quality of water they are receiving from the contractor, i.e., when delivered water TDS is above normal for your system.

Surface and/or ground-water quality data may be available from Reclamation, DWR, or other agencies.

If there are no water quality issues, enter N/A.

E. Water Uses within the District

1. Agricultural

In Table 5, list the crops grown (use the crop list provided in Attachment C of the Plan Format) in the district. Enter the most common irrigation method for each crop, use the irrigation methods listed in Attachment C of the Plan Format. For each crop, list the irrigated acres of the crop, crop ET, leaching requirement, water used for cultural practices (frost protection, pre-irrigation, etc.), and effective precipitation. Table 5 will combine these values to determine the total water demand in acre-feet/yield (AF/Y) of each crop. You may wish to combine crops grown on less than 5 percent of the total irrigated acreage. To combine crops, determine an average crop ET, leaching and cultural requirement, and effective precipitation for this group of small acreage crops. The crop ET for crops in your area can be found in DWR California CIMIS Database, Cal Poly Irrigation and Training Research Center (ITRC) and Center for Irrigation Technology (CIT) Bulletin 113-3 (April 1975) or obtained from the DWR district office or the local farm advisor. The UCCE can also provide information on crop ET and water used for leaching and cultural practices. Effective precipitation by crop must be determined locally or you may contact Reclamation for assistance. Write a short narrative here for any use of water other than that listed in Table 5.

The types of irrigation systems used on each crop can help the contractor to target customer assistance programs, workshops, and educational materials. When the contractor collects information for the yearly Reclamation Crop Report, it can request information on the number of

acres of different irrigation systems used on each crop. Expanding an existing report will minimize contractor and customer cost and paperwork.

2. Urban

Quantify the number of accounts and yearly water use for each of the following customer account types.

a. Single-Family - A connection that serves a residence designed for one family or group.

b. Multi-Family - A connection that serves two or more residential units.

c. Commercial - A connection that serves business water customers that provide or distribute a product or service, such as hotels, restaurants, office buildings, commercial businesses, or other places of commerce.

d. Industrial - A connection that serves business water customers that are primarily manufacturers or processors of materials as defined by the SIC code numbers 2000 through 3999. Industrial customer may also include other operations that use municipal water supplies, such as sand and gravel quarries and cement mixing facilities.

e. Institutional - A connection that serves business water customers that are dedicated to public service. This includes schools, courts, churches, hospitals, and government facilities. All facilities serving these functions are to be considered institutions regardless of ownership.

f. Landscape Irrigation - A connection that serves an urban landscaped area.

g. Wholesale - A connection that provides water to a retail water agency.

h. Reclaimed - A connection that provides recycled urban waste water for specific uses.

i. Other (specify).

j. Unaccounted - a quantity of water that is treated but not sold, lost through leaks, breaks, slow meters, fire fighting, line flushing, etc.

3. Urban Waste Water Collection and Treatment Systems serving the entire contractor's service area.

Describe the waste water collection and treatment systems for the urban area you service. Include the level of treatment, quantity of water treated, and place of disposal of the treated

water. Water providers that do not provide waste water treatment services must request this information from the waste water agency.

a. Waste treatment plant - Provide the name of the waste water plants that treat urban waste water your agency delivered.

b. Treatment level (1, 2, 3) - If there are different treatment streams, quantify the AF treated to each level during the report year.

c. AF/Y - Quantify the quantity of water treated in the designated year.

d. Discharged to - Identify where the treated waste water is discharged (i.e., ocean, river, percolation ponds, etc.).

e. Total discharged to ocean/saline sink - Quantify the AF discharged to these areas during the report year.

4. Urban recycled waste water.

If treated water is recycled, describe the quantity of water recycled and how the recycled water is used.

a. Treatment plant - Provide the name of the waste water plants that produce water for reuse.

b. Treatment level (2, 3) - Quantify the AF treated to each level during the report year.

c. AF/Y - Quantify the quantity of water treated in the designated year.

d. Types of users - Identify the recycled water uses (i.e., landscape, toilet/urinal flushing, fountains and ponds, agriculture, etc.).

5. Ground-water recharge/management/banking.

Contractor operated ground-water recharge areas (as identified in Section 2 - B).
List the quantity of water used for planned and incidental ground-water recharge, including method of recharge.

Make a table showing how much water, where, when, and how water will be recharged.

Example:

Location	How	1999	2000	2001
Well #1	Well Injection	1000 AF	700 AF	0 AF
Res. #7	Percolation	500 AF	200 AF	500 AF

A ground-water recharge program uses imported water to place water into a ground-water basin for later withdrawal or provides surface water to farmers that normally pump ground water (in lieu of recharge) so that the ground water is left in the ground. Do not include incidental recharge, such as canal seepage or deep percolation resulting from excess irrigation, unless data relating to the above points has been developed. Describe each recharge location with respect to soil type, method of recharge, percolation or injection rate, and hydraulic continuity with the extraction areas. Include the AF recharged in the designated year:

a. Recharge area
b. Method of recharge
c. AF/Y

If you participate in a defined ground water banking system, describe it here or attach a description. You may insert your own tables if the information requested is included. In order to participate in a ground water system, water must be able to be withdrawn at a later date. Describe how water that was charged into the ground will be withdrawn later for the contractor's or customer's beneficial use.

6. Transfers and Exchanges.

Transfers into or out of the district.

Describe the source and quantity of water in any transfer, trade, exchange, reschedule to another year, purchase or sale, into or out of the district, and for what uses. Information on transfers and exchanges within the district is not requested. Transfers refer to water exchanges, sales, or other agreements that transfer or exchange water between water users, such as:

a. Agriculture to urban
b. Urban to agriculture
c. Agriculture to agriculture
d. Urban to urban

7. Wheeling or other transactions.

List wheeling or other transactions not covered above that involve water into or out of the district. Provide the following information for the designated year:

a. From whom
b. To whom
c. AF/Y
d. Use

8. Any other uses of water.

If there were other uses of water not covered above, describe them (e.g. water for hydroelectric power, water used to meet water quality objectives, emergencies, environmental deliveries, etc.) and the quantities involved.

F. Irrigation Drainage from the District

If a contractor has drain water, but does not have surface and/or subsurface drain water monitoring programs, the Plan should state how this information will be collected and monitored in the future. If the contractor has no surface or subsurface drain water, state "None" and leave this section blank.

1. Surface and subsurface drain/return flows.

Identify the drain that carries the return flows out of the district and specify where the drain's flow is used or dumped. For example, if the contractor surface return flow is discharged into the Sacramento River, the Plan should state that irrigation runoff and operational spills are returned to the Sacramento River. In this case, specific downstream uses would be unknown.

If surface drain water leaves the contractor's service area and is reused, identify the general location and type of that reuse and AF/Y. If collected subsurface drain water leaves the contractor's service area and is reused, identify the general location, type of that reuse, and AF/Y. If surface and/or subsurface drain water is used within the district for agriculture, wildlife refuges, M&I, or other purposes, describe.

2. Drainage Water Quality Testing Program

Identify which agency tests the drainage water quality and include the information listed below:

a. Analyses performed
b. Concentration range
c. Frequency range
d. Average

3. Contractor's role in the current year drainage testing program.

If the contractor conducts, participates, or funds any part of the drainage testing program, please describe those activities.

4. Any usage limitation resulting from the drainage water quality.

Describe the constituents in the drain water (i.e., selenium, boron, etc.) and the resulting limitations on use. For instance, excessive nitrates would limit the use of drain water for domestic consumption but not for agricultural use. High salt concentrations may limit the use of drain water for agricultural use.

Contractors included in the drainage problem area, as identified in, A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990), should also complete Attachment A.

G. Water Accounting (Inventory)

Develop a water budget for the contractor for the designated year (one of the past 2 years). If a contractor chooses, a representative water supply year can also be included. The intent of the water accounting is for contractors to quantify water supplies, uses, and losses within the district.

Knowledge of the amount of water used for various purposes can lead to improved water management. A water inventory also identifies where a contractor lacks information. When

analyzing BMPs, the water savings resulting from an individual practice can be estimated based on the water inventory. Completing Tables 1 through 8 satisfies all the water accounting data. If you have completed Tables 1 through 8, skip to the next section.

1. Quantify contractors water supplies.

To complete this section, enter the necessary data in the listed tables below.

a. Surface water supplies, imported and originating within the district, by month (Table 1, completed in Section 2, A).

Quantifying surface supplies by month will allow contractors to show what supplies are used to meet water demands, and what supplies are used for ground-water recharge. (Include water transferred to the contractor in "Other Water" in Table 1.)

b. Ground water extracted by the contractor, by month (Table 2, completed in Section 2, B).

c. Effective precipitation by crop (Table 5).

The contractor will have to calculate this information based on when the crop was planted, the soil moisture profile and precipitation patterns and intensity. Information is available from ITRC and CIT. DWR district staff or local farm advisors may also have information on the effective precipitation amounts for the crops grown in your district.

d. Estimated annual ground water extracted by non-contractor parties (if records are not available, provide an estimate and basis for estimation) (Table 2, completed in Section 2 B).

Urban water wells are usually metered, and the information is generally available by contacting the pumpers. If the contractor does not have ground-water production records for private agricultural ground-water pumpers, use the following method to estimate the quantity pumped:

(water needed for crop ET) + (water needed for leaching) - (effective precipitation) * (crop water need)

(crop water need)/(irrigation efficiency) * (estimate of applied water)

(estimate of applied water) - (amount of water delivered by the contractor) * (estimated amount of private ground water pumped)

A similar method can be used to estimate the private urban pumping.

e. Recycled water, by month (water originating from a municipal waste water treatment plant) (Table 3, completed in Section 2, E, 2).

Recycled water is treated urban waste water that is treated and available for reuse.

f. Other supplies, by month (Table 3).

To be defined by the contractor.

2. Quantify water used.

To complete this section, enter the necessary data in the listed tables.

a. Conveyance losses, including seepage, evaporation, and operational spills from canals; and leaks, breaks, fire, and flushing from pipes (Table 4).

Types of canal losses include seepage, evaporation, and operational spills. Losses from piped urban distribution systems results from leaks, breaks, flushing, and fire fighting.

Canal seepage is the most difficult to calculate. Seepage from unlined canals varies as soil characteristics change and the rate of loss per section requires ponding tests, good metering or some other technique. Canal evaporation can be calculated by determining the surface area of the canals and regulating reservoirs and applying the local evaporation rate. Operational spills can usually be calculated since the end of a canal is generally a weir or other structure that could be calibrated. Describe how the values were determined or estimated.

Conveyance seepage is considered a loss of irrigation water, and sometimes, ground-water recharge. For example, when the Friant Unit's class II water is available, conveyance seepage in some cases may be considered a ground-water recharge method. However, when contract water is conveyed, seepage often results in loss of water intended for irrigation, increasing pumping costs and degrading water quality. Practices that reduce seepage can help contractors use water more efficiently, but may require new methods and locations for ground-water recharge.

Losses from urban distribution systems can be calculated by conducting a system water audit. The AWWA Water Audit Manual has complete instructions, worksheets, and examples.

b. Consumptive use by riparian vegetation (Table 6).

Estimate the annual consumptive water use by riparian vegetation inadvertently or intentionally provided with contractor water. Do not include riparian vegetation located at an environmental

or recreational resource. Estimate the total acres of riparian vegetation and an overall use (based on ET during the months when water is available) to obtain an estimate of consumptive use. Information may also be available from local farm advisors and neighboring contractors.

c. Applied irrigation water, crop ET, water used for leaching and cultural practices (e.g., frost protection, soil reclamation, etc.) (Table 5).

This section quantifies crop water need. Crop water need includes crop ET and water used for leaching/cultural practices. Determine the total crop water need for each crop.

ET requirements for different crops in different climates can be found in DWR Bulletin 113-3 (April 1975), Oregon State University Miscellaneous Publication 8530 (1992) and Nevada Department of Conservation and Natural Resources, Division of Water Planning, Miscellaneous Publications. Information is available from ITRC and CIT. DWR district staff or local farm advisors may also have information.

d. Urban water use.

Determine total water sales and other authorized uses. Do not include losses, fire fighting, and system flushing as these were included in Table 4, Distribution System Losses.

e. Ground-water recharge (Table 6).

Quantify water used by the contractor for the purposeful recharge of ground water, including recharge ponds and water injected for ground-water recharge.

f. Water exchanges and transfers (Table 6).

Quantify inter-district water transfers.

g. Estimated deep percolation within the district (Table 7).

Deep percolation is usually estimated as the difference between applied water (minus any runoff leaving the district) and crop water use. Some deep percolation may be necessary for leaching. Excess deep percolation is considered an economic loss since ground-water quality is degraded and energy is used for unnecessary pumping. Water applied for intentional recharge is not deep percolation. Calculate, or if necessary, estimate the designated year's deep percolation.

h. Flows to perched water table or saline sink (Table 7).

Calculate, or if necessary, estimate the amount of deep percolation or drainage that flows to a saline sink or to a perched water table (within 5 feet of the soil surface).

i. Total urban waste water treated and discharged (Table 7).

Quantify the treated municipal waste water that is discharged to the ocean or a saline sink.

j. Irrigation spill or drain water leaving the district (Table 6).

Calculate, or if necessary, estimate the total return flows (surface runoff) leaving the district.

k. Other (Table 6).

Quantify any other uses of water within the district.

3. Overall water budget.

Compare total water estimated to be available for sale within the district with the total water actually sold by the district (Table 6).

Table 6 compares total water estimated to be available for sale with total water sold. This water budget usually identifies areas where water management could be improved and thus helps the contractor to select and implement appropriate BMPs. Evaluation of the BMPs in Sections 3 and 4 requires an estimate of how much water may be conserved by each practice. Parts of this process are imprecise. For example, estimating water savings from education programs is very difficult. However, this process will help the contractor to estimate the amount of potential water savings and the costs of achieving those savings.